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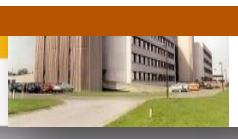

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VOLKSGEZONDHEID, VEILIGHEID VAN DE VOEDSELKETEN EN LEEFMILIEU

Lactoferrin as a new treatment approach of *E. coli* O157:H7 infected ruminants.

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INTRODUCTION

Food contamination with *E. coli* O157:H7 by ruminant manure has been reported as the primary source of human infection, therefore inhibition of *E. coli* O157:H7 colonization and shedding in ruminants could control the risk of human exposure to this pathogen. To evaluate a new treatment approach, we studied the ability of bovine lactoferrin (Lf), a natural antimicrobial protein of milk, to reduce *E. coli* O157:H7 infections in calves and in sheep.

MATERIALS AND METHODS

In a first study, 9 calves were orally inoculated and re-inoculated 7 days later with 10^{10} CFU *E. coli* O157:H7 for 2 consecutive days. On day 3 after re-infection, 3 calves were orally administered 3 g lactoferrin per day for 51 days (oral treatment group) and 3 calves were rectally treated with 300 mg lactoferrin per day for 33 days (rectal treatment group). In a second study, 10 sheep were orally inoculated with 10^{10} CFU *E. coli* O157:H7 for 2 consecutive days. On day 3 after infection, 5 sheep were orally treated with 300 mg lactoferrin a day (Lf group) and after 19 days with 3 g a day for 14 days. In both studies, the colonization control animals were sham-treated with PBS orally. Fecal excretion was monitored 2 times a week by direct plating and an enrichment.

RESULTS

In calves (Fig.1), magnitude and duration of fecal O157:H7 shedding was similar for the oral treatment group and the control group. Animals in both groups were excreting bacteria in the feces during at least 54 days. In contrast, rectal administration of LF induced a reduction in fecal *E. coli* O157:H7 excretion from day 8 onwards. The shedding pattern of the rectal treatment group and the control group was significantly different from days 19 to 22 and days 33 to 36 ($p \leq 0.05$). On day 12, two animals from the rectal treatment group already ceased excreting *E. coli* O157:H7. Both stayed negative till the end of the experiment (day 36) without further LF administration, even though the other animal in this group remained positive by direct enumeration until day 26. In sheep (Fig.2), the oral administration of 0,3 g LF/day could not reduce the excretion of *E. coli*. Therefore, after 19 days of treatment, we raised the daily dose to 3 g LF/day. Subsequently, fecal shedding decreased in the LF group, although there was no significant difference between the LF group and the control group.

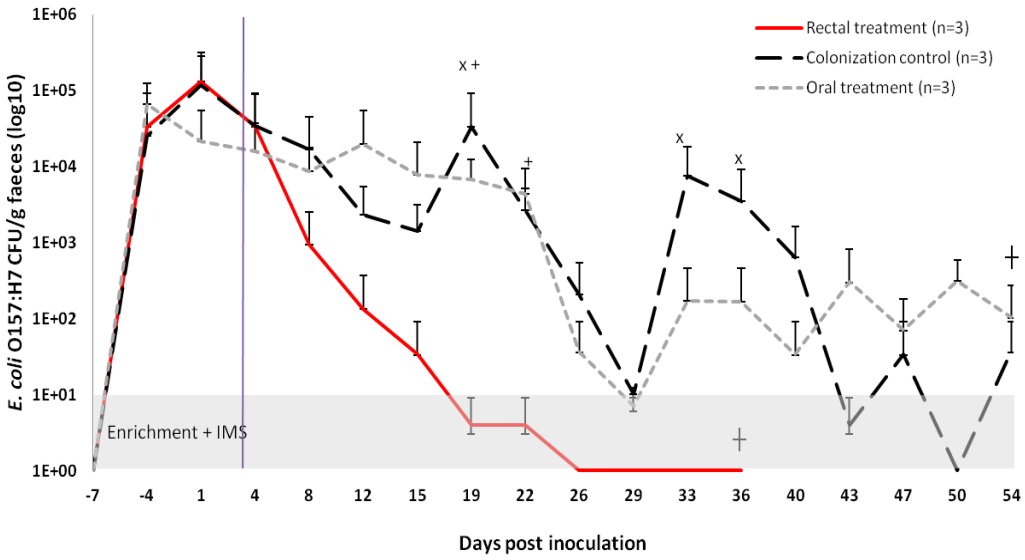

Fig.1 Average of *E. coli* O157:H7 excretion following infection, oral and rectal LF treatment of calves. x Significant differences in bacteria excretion between control and rectal treatment groups, + Significant differences in bacteria excretion between oral and rectal treatment groups, † Euthanasia.

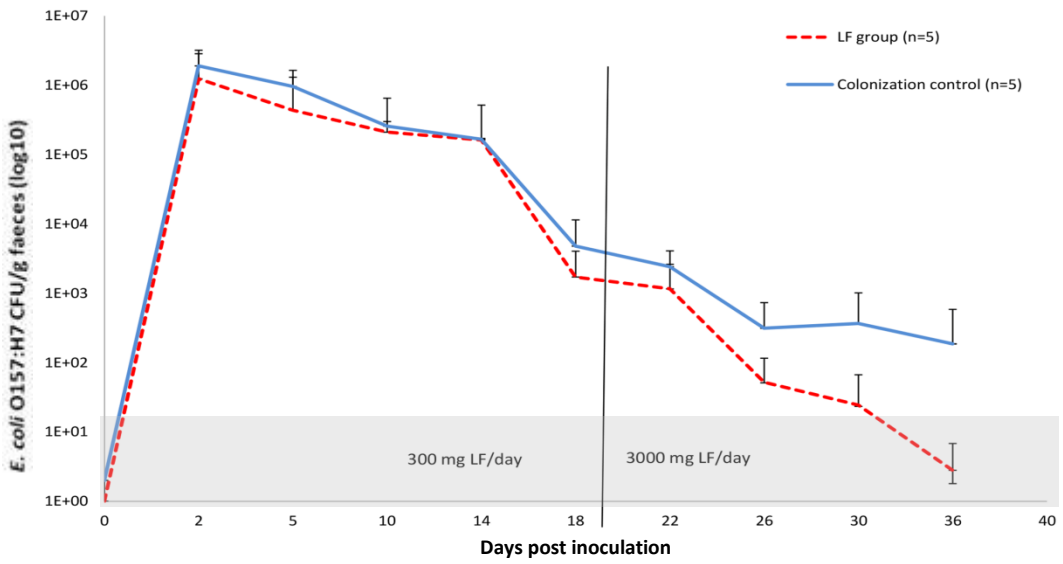

Fig.2 Average of *E. coli* O157:H7 excretion following infection and oral LF treatment of sheep. Compared to the control group, excretion in the LF group decreases faster when administering 3g LF/day (not statistically significant).

CONCLUSIONS

Our data demonstrate the reduction of *E. coli* O157:H7 shedding in calves and sheep due to administration of lactoferrin. In conclusion, lactoferrin could be used to clear *E. coli* O157:H7 infection in ruminants and could thereby reduce the zoonotic risk for humans.